Bachelor of Arts thesis by Annika Nygrén

Plant Care Kit development process for small scale production — company collaboration with Mother

Aalto-University
Department of Design
2019

IMAGE 1: Annika Nygrén

Aalto University
School of Arts, Design
and Architecture

Author Annika Nygrén

Title Plant Care Kit development process for small scale production; company collaboration with Mother

Department Design

Programme Industrial design

Supervising professor Simo Puintila

Thesis advisor Dries bovijn

Year 2019

Pages 50

Language English

Abstract

This thesis discusses the process of designing a plant care kit from concepting and ideation all the way to an outline for production. The project was done in collaboration with the Belgian brand Mother, which focuses on creating sustainable and enabling products and services for both consumers and commercial use.

The project consists of a research phase, where the context and conceptual constraints and goals are established, as well as a design phase, where the concept finds its physical form, identity and outlook. The research phase aims to answer the questions of what, why and how and is largely composed of a report of common gardening issues and solutions. The scope of the kit gradually narrows down from an all-inclusive troubleshooting kit, through multiple iterations at the face of real life constraints, to a basic care kit of two fairly essential products: a fertiliser and a pesticide.

Keywords packaging design, gardening, Houseplants, Company collaboration

Table of contents

1. Introduction 4

2. Project initialising 5

    2.1 Mother as a company 6

    2.2 Defining the concept through the user 8

3. Context research: what, why and how 9

    3.1 Existing products 10

    3.2 Indoor horticulture: Ornamental VS. Edible 12

        3.2.1 Needs 12

        3.2.2 Fertiliser 13

    3.3 Problems 14

        3.3.1 Pests 14

        3.3.2 Diseases 15

        3.3.3 Abiotic problems 16

        3.3.4 Soil pH 16

    3.4 Treatment 18

    3.5 Conclusions 20

4. Design process 21

    4.1 Concept 1.0 22

    4.2 Reality check and a change of plans 29

    4.3 Concept 2.0 30

5. Results 42

6. Reflections 47

Sources 48

1. Introduction

Houseplants are a trend that unlikely has gone unnoticed by anyone in the modern era of social media and culture of constant and immediate news flow. The new rise of the old trend at this day and age however is completely different from what the generation X and before them have experienced, as a result of the hectic, information overloaded and technology driven world we live in. Information is readily available within the reach of our fingertips, at furthest by a few swipes, which is both enabling and disabling at the same time. For someone new to the hobby of gardening, both outdoors and indoors, this might be equally fascinating and overwhelming. If the first problems arise before one has established sufficient knowledge on diagnosis and troubleshooting, it might leave the beginner handicapped in the situation, make them try out things randomly or by what a random website on the internet suggested.

In this thesis I aspired to tackle this problem by designing a plant care kit in collaboration with the belgian brand Mother. The goal of the project was to generate a concept that would enable and empower new growers without underestimating them. The target was to create a kit that in essence is suitable for all levels of experience and for both indoor and outdoor growers through research, concepting and ideation all the way to an outline for production.

As mainly an industrial design student who at the initiation of the project was fairly foreign with the world of packaging design and other related fields, such as layout and graphic design, the task seemed equally enticing and frightening. During the process I had to implement my knowledge in design onto new areas and got to adapt the iterative excersises on product development for real life constraints for the first time on my design career.

2. Project initialising

At the last week of July 2018 I received a comment from a belgian start-up on my houseplant related Instagram account. The comment was meant to advertise their company and their back then only product, the Bloom grow light. The light wasn't yet openly sold but I got interested enough to send them a message about it, and during the conversation managed to slip that I study design. Turned out I was chatting with theirfounder and designer, Dries Bovijn. We ended up having a video call where he elaborated his interest for collaboration on their "to-do projects", one of which was a goal of producing a plant care kit. We continued discussions until mid-September when all agreements were signed and officially initiated the project.

2.1 Mother as a company

Mother is a Belgian based brand operating under On a Mission BVBA. Mother aims to create sustainable growing solutions for both consumers and for commercial use. Their goal is to empower consumers by making them less dependent instead of more dependent. Currently they are achieving this by producing a grow light called Bloom that they claim to last a lifetime, thanks to high quality materials, a modular construction and a timeless, minimalistic design. By the time I am writing this, in summer 2019, they have also released the pre-order of a more compact version of the lamp, conveniently called the MicroFarm, which is targeted for growing microgreens and recently received 1200% of its funding on Kickstarter.

Their approach to design is user-oriented and minimalistic. Mother's design communicates quality and attention to detail. Their brand strives for minimalism without compromising usability, with one of their leading principles being "form follows function".

What makes the brand unique is that they offer professional quality design grow lights that are as suitable for home environments as they are for commercial applications; as an example, the company PachaGreens utilises Bloom as their primary light source for growing micro vegetables. Since Bloom was at the time the only existing and no more merely a conceptual design, it was my main reference point to designing further products for the brand.

Visually the image Mother represents is in par with their ideologies: simple, minimalistic and defined. As a young and a dynamic brand and a small company, for they do not have official design guidelines or such. For this reason, I have made my design decisions based on Mother's current look as of Autumn 2018 to Spring 2019, as well as the feedback I have received from the company. In accordance to their core values I have set it a key design goal for it to be sustaining of both time and the environment.

The main colours of Mother are black and white, paired with colourful imagery and playful infographics. Used photography is always high quality, vibrant, fresh and pleasant to the eye, as can be seen on images 1, 2 3 and 4 on page 7.

Examples of brand presentation

IMAGE 2: *Bloom grow light*

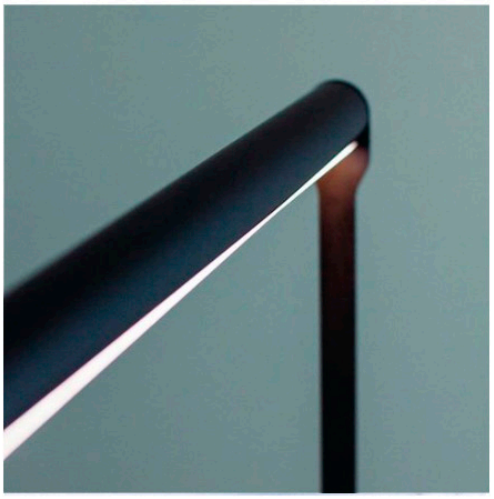
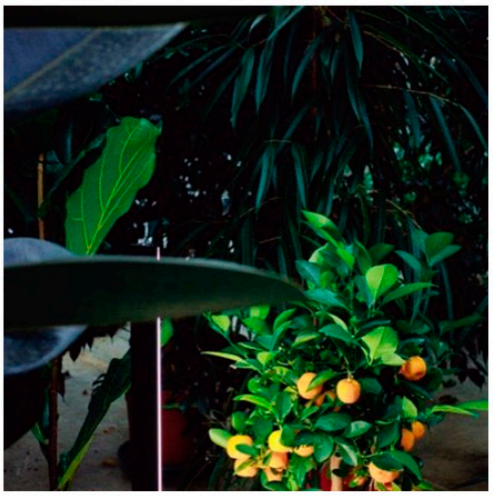


IMAGE 3: *Bloom grow light*



IIMAGE 4: *Bloom grow light*

IMAGE 5: *Radish soup*

Mother

IMAGE 6: *Brand name with logo*

2.2 Defining the concept through the user

In this section I go through the process of defining the quintessential purpose and scope of the kit, which is mostly defined by defining the user and their needs and capabilities. As the project wasn't very specific, I went back and forth with my own analysis and the brand with a goal to define the framework to be motivating for all parties.

In this thesis I will be heavily relying on my knowledge on indoor plant care and my experience of being an active member of the community for several years, as it is also the key factor of why I was asked to execute this project. My interest in the topic has been motivated by my own interests and I have done my own research with the best of my abilities throughout the couple of years I've actively grown plants. For spesific pieces of information I have utilized more reliable sources of information when available.

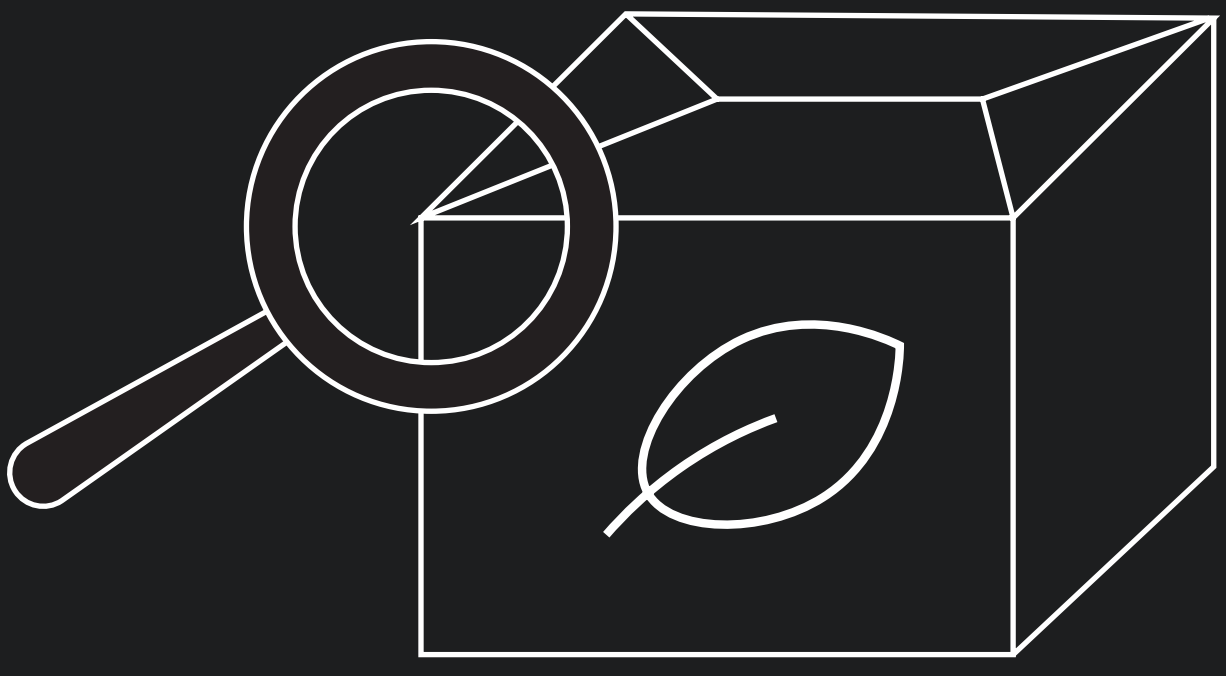
The project started off with the discussion about collaboration to create a plant care kit. The prompt was very open and my contact and advisor from the company, Dries Bovijn, specified the scope further with some reference photos to similar concepts of other product categories as we discussed about it.

Ultimately my task was to design the concept in entirety from defining the user and their needs all the way to executing the concept into a form from where it could be easily forwarded to manufacturing by the company. The initial conversations lead me in a highly inclusive direction of creating a kit that would be a fix it all to plant-growers' problems. Ideating and defining the initial concept started in a very broad scope of including growers of all levels of expertise and both indoor and outdoor gardeners. I will go through the instances which lead to defining the contents of the kit further in the section *4. Context research: what, why and how*.

A key defining factor I decided very early on the project in the light of my own expertise on the field was that if the kit is to serve growers from complete novice to professionals, the content needs to be fitted according to the least knowledgeable user. One of the reasons for this choice was that it can be expected that the professionals who are highly capable and very susceptible of creating their own repertory of plant care equipment, combined with their much smaller numbers compared to novice, are certainly going to be a notable minority in the users of the conceptual kit. Thus, the main target user for the kit was dictated to be the novice growers who are just getting into the hobby and are eager to learn more. With these factors in mind and with my confidence in my own knowledge I decided that the main user in this instance is ignorant when it comes to what they actually need in their lack of knowledge of obstacles they may face and even more, the suitable and environmentally conscious solution to the issues as well as the prevention for future instances.

3. Context research: what, why and how

In order to find out what products could and should be included in the kit, I conducted research on existing kits and other solutions, the realities of creating a kit that fits both indoor and outdoor plants, what problems the kit should solve and how. In this section I try to the best of my abilities utilise outside sources but also use my experiences where they are applicable. The following research is also what I referred to multiple times during further concept development whenever I had to reason my choices to the company, or if we had any minor disagreements on anything. However, it was in no point seen as the last word, but merely a tool for discussion on what information guided previous choices and a summary of reasoning for further proposals on handled topics.



3.1 Existing kits

When searching for products with the keywords “plant kit” or “plant care kit” on various platforms, the related products can be divided to the following groups, listed from most common appearance to least:

1. Planting kits: materials and equipment for starting different plants from seed, usually including (biodegradable) pots, a sowing medium and the seeds themselves. Example: Image 7 on page 11.

2. Gardening tool kits: including a mister, a hoe, harrow, among other things. Example: Image 8 on page 11.

3. Species specific kits: usually including one or more fertilizer, pesticide and often other related equipment, specifically developed for one species/type of plants, i.e. tomatoes, orchids or fruiting trees. Example: Images 9, 10 and 11 on page 11.

4. Soil testing kits: equipment for testing soil for pH, and Nitrogen (N), Phosphorus (P) and Potassium (K) concentration. Example: Images 12 and 13 on page 11.

5. Growing medium pH adjustment kits: includes two solutions for lowering and raising pH and materials for testing pH of growing medium. Commonly specifically for inorganic medium, such as hydroponics, because of lack of pH buffering abilities of the soilless medium. Example: Image 14 on page 11.

Excluding the orchid kits, most of the kits listed above seem to have a clear division between experienced hobbyist and an average consumer use. The average consumer targeted kits seemingly lack soil testing equipment, they appear simple and more easily approachable with greater emphasis on outer appearance, whereas the hobbyist kits look less put together, complicated and often aversive. Tests for mediums seem more common hobbyist use kits as well as single nutrient fertilizers.

Most kits include at least one fertilizer and additional materials, depending on the purpose. Some purpose-specific kits include ample instructions or care guides for the care of the plant, as well as the setup and use of the products.

Based on these findings the conclusion can be made that there is a lack of all-purpose and all-included indoor plant care kits on the market. Judging by the evidence it is not clear if this is a result of limited demand, consumer research – or lack of it – or for other reasons.

The most direct competition for the Mother plant care kit are likely the species-specific care kits, which are limited to a very narrow scope. The growing interest towards indoor plants[1] needs to be met with suitable solutions that fit with the growing public knowledge and interest on plant care. which can be seen in far more people investing in grow lights and paying attention to soil pH, alternative growing mediums and DIY care solutions.

1 *Instead of houses, young people have houseplants, The Economist 6.8.2018.*

Existing products

IMAGE 7: *Plant Theatre, Funky Veg Kit*

IMAGE 8: *Pinch Provisions, Plant Lady Kit*

IMAGE 9: *Bonsai Kit*

IMAGE 10: *GrowScript Kits*

IMAGE 11: *Organic tree care kit*

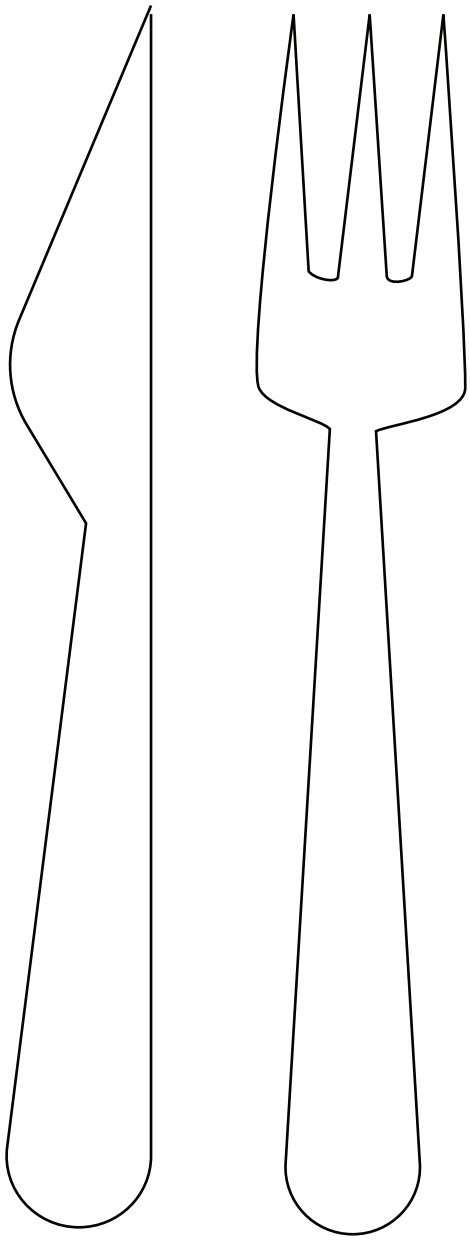
IMAGE 12: *Soil Test Kit*

IMAGE 13: *Soil Test Kit*

IMAGE 14: *pH Control Kit*

3.2 Indoor horticulture: ornamental vs. edible

As the kit is to be suitable for both ornamental plants and edible crops, it needs to fit the requirements for both. These requirements are obviously more strict for the use on edible plants, as the substances on the plants can be ingested by humans. Thus the main concerning difference between growing edible and ornamental plants is safety. Pesticides, fertilizers and other amendments used for edible plants can't contain anything that accumulates in the plant and that can be harmful for humans when ingested, unlike with ornamental plants. We also need to make sure no pathogens are able to grow or accumulate in the soil or structures of edible plants, and preventative methods need to be taken to ensure that. It is important to use pesticides, fungicides and fertilizers that are safe to use on edible plants.



3.2.1 Needs

The most fundamental needs for any living plant are light, water and nutrients. All of these are essential for photosynthesis and other vital mechanism to function in the plant, and when they are met correctly, chances for survival are high. Additionally, a plants health can be affected by the temperature, relative air humidity, pests and diseases. The ratio of needs each plant has varies between species and often even between cultivar or variety, but an educated guess can be made judging by the plants' appearance. [2] [3]

---

2 *Bodie V. Pennisi, Growing Indoor Plants with Success, UGA Extension (2017).*

3 *Kathleen M. Kelley, Mary Concklin, Caring for Houseplants, PennState Extention (2007).*

3.2.2 Fertiliser

Fertilisers are divided to synthetic and organic fertilisers. Synthetic fertilisers are man-made mineral solutions that provide immediate nutrients to the plants, but do not aid in the soil composition in the long-term, whereas organic fertilisers compose of organic matter (manure), which can be plant or animal based.

Organic fertilisers aren't as precise as synthetic ones and the nitrogen(N)-phosphorus(P)-potassium(K) ratios (further: NPK) of these are lower, because NPK refers to immediately accessible nutrients, and organic fertilisers rely on soil micro-organisms to break them down to accessible nutrients for the plant. This is why they also help improve or upkeep the condition of the soil, but they can be limited in their ability to provide nutrients if critical bacteria are absent in the soil. Soil temperature affects the level of activity of these bacteria and thus the nutrients are less available during a colder period. This bacteria is also the reason organic fertilisers should mainly be used in soils high in organic content, and with soilless or sandy soils it is best to either supplement with synthetic fertilisers or use them as the primary source of nutrients.

Synthetic fertilisers by themselves are toxic when ingested and can cause skin irritation, but when used correctly they do not pose harm. If fertilised water remains on the leaves, the salts can dry up and leave remains in the plants, though quantities of these salts required to cause symptoms on adults are quite big. Under the category of synthetic fertilisers, in addition to the standard liquid compound fertiliser there are also slow-release and controlled release granules and straight fertilisers that only compose of a single nutrient. The solubility of slow-release fertiliser is greatly affected by the moisture and temperature of the soil and nutrient intake of the plant. As the nutrients from synthetic fertilisers are immediately available, there is also a risk of burning the plant with excessive fertilising. This risk is practically non-existent when using organic fertilisers.

In terms of the optimal NPK-ratio for a certain plant, it comes down to what the soil already has and what it lacks in relation to the plant's needs. Determining this requires firstly knowledge on the species' specific needs and then testing the nutrient content of the soil in regular basis and feeding accordingly.

3.3 Problems

Most problems occurring with houseplants are abiotic. Problems can also arise when there is no mistreatment from the gardener, but instead by external factors such as bacteria, viruses, fungi and pests.[4] In the following sections I will go thoroughly through the most common problems growers face and how these problems would be most effectively treated against and prevented.

3.3.1 Pests

The pests that are most commonly encountered in indoor potted plants include aphids, mealybugs, fungus gnats, spider mites, scale insects, springtails, cyclamen mites, thrips, slugs and snails, shoreflies, whiteflies and leafminers. Recommended treatment options are mechanical and chemical treatments, for best results both are recommended. Mechanical treatment includes manually removing the pests, switching the soil and cleaning the plant, its roots and the pot. Sticky traps also help to control the population, but don't completely eradicate the problem. [5] [6]

Chemical treatment refers to pesticide, which there are multiple options of. Pesticides can be divided into organic and synthetic ones. Organic ones are usually quicker to decompose than their synthetic counterparts and thus more frequently recommended for use on edible crop. Organic options are usually derived from naturally occuring sources that are then concentrated, such as pyrethrin, and they have a short operating time due to the quick decomposition. This is why organic pesticides are usually required to cover the insects in order to work, and multiple treatments are required, whereas synthetic ones often operate systematically. [5]

---

2 *Bodie V. Pennisi, Growing Indoor Plants with Success, UGA Extension (2017).*

4 *Mary Concklin, Kathleen M. Kelley, Preventing, Diagnosing, and Correcting Common Houseplant Problems, PennState Extension (2016).*

5 *Missouri Botanical Garden, Common Garden Pests and Problems.*

6 *Janet Knodel, Esther McGinnis, Kasia Kinzer and Ron Smith, Houseplants Proper Care and Management of Pest Problems, NDSU Extension (2016).*

3.3.2 Diseases

Development of a disease on a plant has three requirements: a susceptible plant, a viable pathogen, bacterium or fungus and a favourable environment.[2] Plant becomes susceptible if it is under stress or physically damaged, and stress in turn can be caused by environmental factors such as over-watering, which also creates a favorable environment for bacteria and fungi to grow.

Most common diseases for houseplants include the following: powdery mildews, rots, grey mold (botrytis blight), rusts, blights and different viruses and bacteria. Viruses are usually highly contagious and non-treatable on plants, therefore there is currently no treatments available, and it is best to discard a plant that has caught a virus. However, viruses can be prevented to some extent by monitoring the plants for thrips and other virus carrying insects and taking care of proper hygiene by disinfecting equipment between use on each plant and avoiding causing stress to the plant by practicing proper cultural methods.[2 5]

The best treatment for bacteria and fungi borne diseases on plants are usually that of making the environment less favourable and the plant less susceptible. This is usually done by improving air ventilation and examining the plant for causes of stress, such as drought or incorrect temperature range. It is also advised to remove any affected growths or plants if possible, and quarantine any concerning plants.

On the market there are also fungicides, and even though they can slow or stop the growth of the fungus, many of them are designed to only prevent disease and are not highly effective after symptoms have occurred[7]. Natural fungicides include copper, sulphur, bicarbonates and different types of oils, such as neem and horticultural oils, that can also be effectively used as insecticides[8 9]. [10]

---

2 *Bodie V. Pennisi, Growing Indoor Plants with Success, UGA Extension (1/2017).*

7 *National Pesticide Information Center, Fungicides (2017).*

8 *Janna Beckerman, Disease Management Strategies for Horticultural Crops, Purdue Extension.*

9 *W.S. Cranshaw, B. Baxendale, Insect Control: Horticultural Oils, Colorado State University Extension (12/2013).*

10 *David L. Clement (1993), modified by Diane M. Karasevicz (1/1995), An Introduction to Plant Diseases, Cornell Cooperative Extension.*

3.3.3 Abiotic problems

Abiotic problems are those that are caused by non-living agents, such as cultural or environmental, or physiological and non-biological factors. These factors include watering, nutrients, light, temperature, relative air humidity, pH and type of medium, pot characteristics and salt build-ups. [2]

The best way to prevent abiotic problems from occurring is by information. In order to care for a specific plant in a correct manner one needs to have at least the basic knowledge of the care and culture of that plant. As these problems are something, that is mostly or completely in the hands of the grower indoors, they are easily corrected by changing the cultural and environmental conditions of the plant, i.e. changing soil to a better draining one or providing a grow light. [2 5]

3.3.4 Soil pH

Optimal soil pH varies between 4 and 8 depending on the plant. Soil pH out of this range can negatively affect the availability of important nutrients and affects the abilities of both beneficial and pathogenic microorganisms, bacteria having the biggest impact because of their narrow pH scale for optimal growth.[11 12]

Regarding ornamental plants, slightly too acidic/alkaline might not have substantial effects on plant appearance, but it can translate to the nutrient contents and taste, which is important to consider when growing edible plants. Adding organic matter helps with the pH buffering abilities of the soil, though the abilities are more limited in containers. When using organic fertilizer it is advisable to measure and adjust the soil pH as the working mechanism of organic fertilizer relies heavily on the soil bacteria to convert the nutrients into a useful form for the plants. Also the composition of the fertilizer (both organic and synthetic) itself might affect the pH.[13]

Soil pH can be measured using a portable pH meter or a colorimetric testing kit. These kits usually require you to mix a bit of the soil with distilled water and then a colour changing dye is added to the sample. For approximate measures also pH test strips can be used for this purpose.

For a quick fix, pH can be lowered using water that is of the wanted pH or a little on the stronger side. For slower, long-term results it is advised to add substances to the soil that leach pH

---

11 *The Australian Wine Research Institute, Vineyard activity guide, Measuring Soil pH (2010).*

12 *Johannes Rousk, Erland Bååth, Philip C Brookes, Christian L Lauber, Catherine Lozupone, J Gregory Caporaso, Rob Knight and Noah Fierer, Soil bacterial and fungal communities across a pH gradient in an arable soil, The ISME Journal volume 4, pages 1340–1351 (2010).*

13 *Paul R. Fisher, William R. Argo, Managing the pH of container media, University of Hampshire Cooperative Extension (2015).*

altering components and change the pH in a matter of weeks to months, lasting for long periods of time. For immediate results, diluted coffee or vinegar (acetatic acid) can be used for watering to lower pH and in turn diluted bicarbonate of soda can be used to increase pH. These methods do not permanently shift the pH and should be repeated often with weak solutions.

Longer lasting results can be achieved by mixing limestone or calcium carbonate into the soil to raise pH and elemental sulfur, aluminum sulfate or sulfuric acid can be used to lower pH.[14]

14 *Sherry Combs, Reducing Soil pH, Wisconsin Horticulture (2007).*

3.4 Treatment

When treating a plant for disease or pest it is of utmost importance to firstly identify the problem causing agent and only then turn to chemical treatment methods. As previously mentioned, most houseplant pests are best prevented by practicing appropriate cultural care and avoiding causing excess stress to the plant, and making the environment unfavourable to pests and pathogens.

After identification the problem can be treated using either physical or chemical control, and often they are used together for best results. Physical control means discarding affected or at least heavily infected plants/parts, manually removing pests and spraying down the plant with sufficient pressure to push most of the unwanted critters off. After this chemical treatment can be applied to the affected plants, and depending on the case also to other plants that risk hosting the pests or disease. When treatment has taken place it is important to identify what caused the problem to prevent future occurrences.

I have gathered some of the active ingredients (AI) approved for indoor use on edible plants in the EU and US on Table 1 on page 19. Information in table is gathered from the following sources:

9 *W.S. Cranshaw, B. Baxendale, Insect Control: Horticultural Oils, Colorado State University Extension (12/2013).*

15 *Isman Murray, Botanical insecticides, deterrents, and repellents in modern agriculture and an increasingly regulated world, National Center for Biotechnology Information, PubMed (2008).*

16 *Mishra AK, Singh N, Sharma VP, Use of neem oil as a mosquito repellent in tribal villages of mandla district, madhya pradesh, National Center for Biotechnology Information, PubMed (1995).*

17 *Estefânia V. R. Campos, Jhones L. de Oliveira, Mônica Pascoli, Renata de Lima and Leonardo F. Fraceto, Neem Oil and Crop Protection: From Now to the Future, National Center for Biotechnology Information, PubMed (2016).*

18 *Wenneker M., Kanne J., Use of potassium bicarbonate (Armicarb) on the control of powdery mildew (Sphaerotheca mors-uvae) of gooseberry (Ribes uva-crispa), National Center for Biotechnology Information, PubMed (2010).*

19 *EU Pesticides Database*

AI	*Target pest*	*Additional information*
Spinosad*	Thrips, leafminers, spider mites, mosquitoes, ants, fruit flies and others.	Substance made by soil bacterium.
Pyrethrin*	Mosquitoes, fleas, flies, moths, ants, and many other pests, including aphids, spider mites, mealybugs, thrips (excl. Frankliniella occidentalis), whiteflies and various larvae.	Naturally occuring in Chrysanthemum cinerariifolium flowers.
Permethrin	Mosquitoes, fleas, flies, moths, ants, and many other pests, including aphids, spider mites, mealybugs, thrips, whiteflies and various larvae.	Synthetic compound that mimics pyrethrin.
Neem oil (azadirachtin)*	Mealy bug, beet armyworm, aphids, the cabbage worm, thrips, whiteflies, mites, fungus gnats, beetles, moth larvae, mushroom flies, leafminers, caterpillars, snails, locust, nematodes and the Japanese beetle, black spot, powdery mildew, anthracnose and rust fungi.	Extracted from the fruit and seed of Azadirachta indica.
Horticultural oils	Adelgids, aphids, eriophyid mites, leafhoppers, scale, insects, spider mites, whiteflies, also used to treat powdery mildew and some aphid-transmitted diseases	Includes refined petroleum based mineral oils and natural light vegetable oils.
Sulfur, lime sulfur*	Powdery mildew, rose black spot, rusts, and other diseases.	Must be applied before disease develops, phytotoxic when combined with oil. Low toxicity to people. Can injure sulfur sensitive plants.
Bordeaux mixture (lime sulfur, copper)	Fungi, such as powdery mildew, downy mildew, and various anthracnose pathogens, and bacteria, such as bacterial leaf spots and fire blight.	Potentially damaging to host plant, especially young growths.
Bicarbonates*	Powdery mildew, various blights, anthracnose, rust, dollar spot and other diseases.	Bicarbonates combined with oil become more effective but also have a greater chance at damaging the host plant.
Insecticidal soaps	Available for any common pest insect.	Abundance of options.
Captan	Black rot, early and late blight, and downy mildew, among others.	Can leave residue that is mildly toxic to humans. Non-systematic.
Iron phosphate/ ferric phosphate*	Slugs and snails.	

** = Some products with this active ingredient are approved for use in organic farming in the EU.*[19]

3.5 Conclusions

In conclusion it can be stated that by taking care of the fundamental needs of a plant, the chances of getting pests or diseases is substantially lower. In order for these needs to be met the grower needs to have sufficient information of both the culture of that specific plant, and also information of the most commonly encountered problems, as premature discovery of any problem is key to successful treatment.

This also requires satisfactory monitoring of the plants. Additionally, it is useful in seeking out possible future causes of problems when the grower has adequate knowledge on the main causes of common plant disease and is able to prevent any further problems from arising by eliminating any concerning factors, such as excessive moisture. Only after these factors have been taken into conclusion, should other methods of prevention and elimination be applied.

4. Design process

In the following sections I will describe my design process in a chronological order. Though the research section is also a crucial part of the design process, in this part I discuss solely the following iterative process of defining the concept according to the results I gathered from my research as well as the realisation of the conclusions. Additionally, I will be implementing the brand identity and mission into the concepts through material and design choices. During the process I received support from the company and decision-making was partly guided by their feedback, in order to create a satisfactory end-result for both parties. I also used my previous knowledge and experiences as a reference point where it was applicable.

4.1 Concept 1.0

In the light of the previously explained research the most logical solution to the user's issue would be information, but since the primary goal was to make a product kit and not a service, I continued to define the contents of the kit. For the second-best solution I proposed the following contents to be included in the kit:

1. **Fertiliser:** Organic fertiliser with preferably including little added synthetic fertilizer to ensure readily available nutrients. The defining features would be the safety compared to an all-synthetic one in terms of human and soil toxicity, and it also helps to condition the soil, unlike synthetic ones.

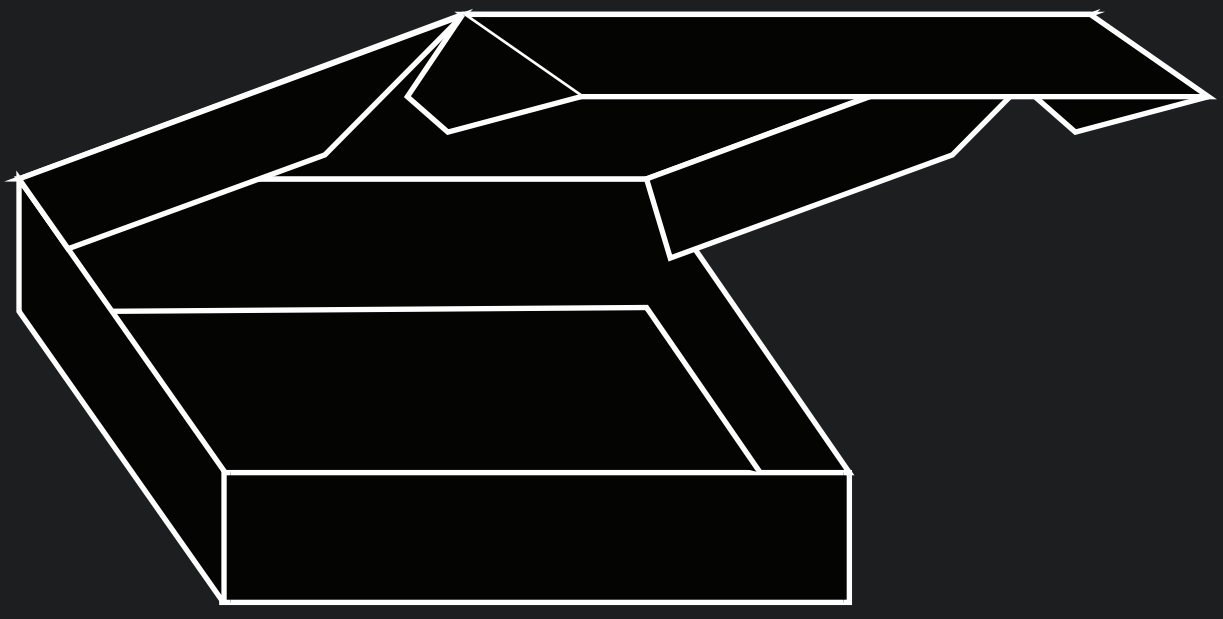
2. **Pesticide:** Neem oil is a good all-purpose pesticide that can be used to fight many insects, fungi and bacteria. Additionally, a more powerful pesticide, such as pyrethrin or spinosad, could be included to fight thrips and other more difficult insects.

3. **Sticky traps:** A couple of sticky traps (colours: white, yellow and blue) could be included to aid in prevention and monitoring of pests.

4. **Soil testing:** A pH test kit would be beneficial considering the importance of soil pH in terms of nutrient availability. Additionally, the kit could include a nutrient test (NPK) and straight nutrient fertilisers for correcting any deficiencies. For adjusting pH, the kit could include a small amount of limestone and sulphur, or other alternative substances.

5. **Instruction sheet:** As has been stated in the research report, the best way to treat and prevent problems is information. A small general instruction sheet about most common alarming signs and treatment suggestions would be good to include, in addition to the essential instruction sheet for the materials in the kit itself.

Sketches of first concept



These proposals were made under the goal of making an all-exclusive kit that could fix it all. I explained my findings and reasoned my conclusions to the company and continued ideating with the kit and its contents. This realised in the form of sketching and researching possible packaging manufacturers. At this stage we discussed that the initial test patch of the products would be around 50 kits. This narrowed down possible manufacturers and packaging options quite a bit.

While I was sketching, I spend quite a lot of time looking for and contacting manufacturers and suppliers that could produce the kit, which at the time was important but looking back didn't result in huge added value relating to the used time. Long response times and difficulties finding suppliers for small samples resulted in me dropping out of the schedule, which I now understand to have been way too tight for a project like this in the first place. I was too set on delivering a manufacturing ready kit, that I didn't let it stop me from making this kind of silly mistakes.

The kit started slowly finding its form with the previously mentioned contents. In the initial sketches I didn't pay too closely attention to the sizes of different products, the focus was mostly in finding a balance between quantities.

In the first concept one of my main focuses was re-designing the sticky-traps (p. 23-24), which to this day are almost exclusively sold as unsophisticated, giant sticky squares with attachment solutions that can be labelled as very heavily DIY. Only requiring a sticky piece of thick paper or thin cardboard, I figured this was a relatively easy product to produce in a custom shape. In this case I saw it as a development that could deliver the user significant value in helping to monitor and control pests on plants while doing those in an aesthetical manner. There was also the most potential for creating a completely new, brand product, whereas for the other product in the kit the ingredients would be outsourced and generic.

I sketched different shapes and configurations of the sticky traps and quite early settled for a tear shaped one. The benefits of that one was the ability to stick it into the soil of the plant, as well as glue it onto the plant or the pot. The shape is derived from the round O-logo of Mother where I added two tangential lines to create the pointed end. With quick and simple prototype iterations I determined that for all optimal use the slabs could be 100% covered in sticky glue on one side, and 1/3 the way from the other. The glue on the backside needn't to be the same sticky glue that is primarily used to catch insects, as it may leave residue on pots and other surfaces. Either the glue had to be firm enough to not leave residue, or there needs to be two types of glues.

Out of all the categories of products, soil testing was the one that was left most open during the proposal as I had to do more research on what the reasonable solutions for such products were. Since the main customer of the kit is a novice home grower, the pH measurements needn't to be extremely precise, nor does the scale need to be all the way from 1 to 14. Thus, pH-paper strips come to play.

There are multiple different types of pH-measuring-paper, most common ones being the roll-kind which changes to a single colour, and the strips with two or more individual squares of different types of measuring paper that change colours. From these two I wanted to go with the latter one, as using a single strip of paper both gives the customer a set number of measuring tools so they don't run out from using too much of it, it is also more friendly to use since the strips have a long, blank side for holding. This is not the case with the roll of paper, and in worst case you could compromise the paper with your fingers.

Packaging wise I wanted to emphasize Mother's ideologies: sustainability without compromising usability. This led to the idea of having the strips in a cardboard cylinder. A though of combining the rounded logo somehow with the cylindrical shape was already delicious in my mind. The cardboard would likely be enough to protect the strips from too much moisture.

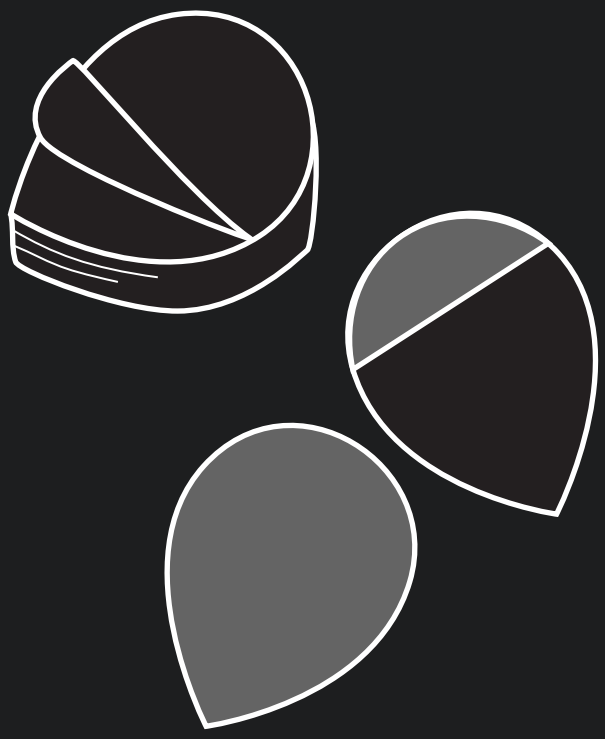
pH test pack

pH test strips

50-100 pieces

pH chart on the outside

Matte black cardboard cylinder



Sticky trap stack

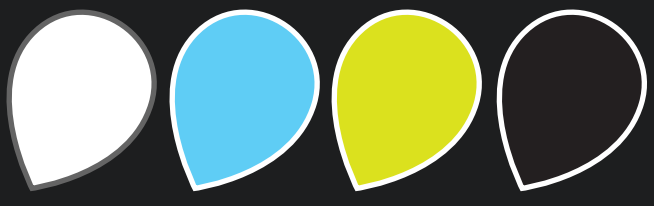
~20 pieces

Minimalistic tear shape

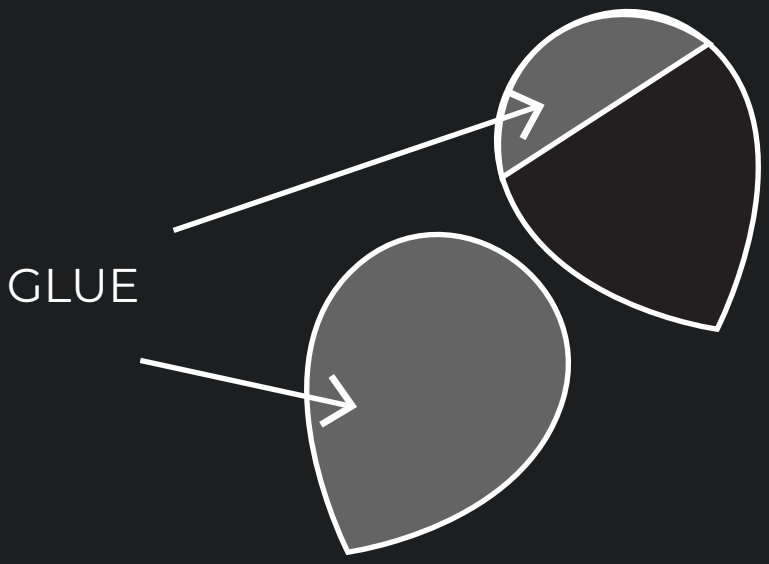
Stacked

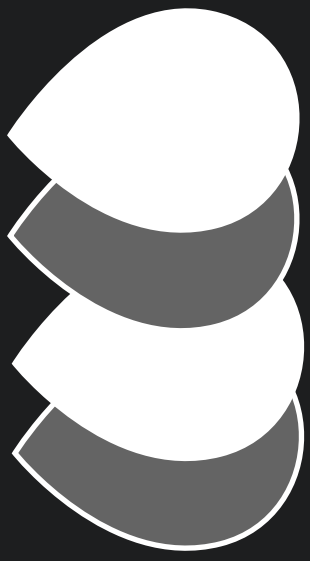
Bio degradable oil-paper cover between each sheet

Colour options: white, blue, yellow, black



Sticky trap design concept





Despite the undeniable benefit of purposeful soil pH adjustment materials, with the lack of knowledge from user behaviour I decided to not include those in the kit. This is because for short term, the pH of the soil can be tilted with the use of acidic or alkaline materials with watering or mixed into the soil. In practise this could mean watering plants with leftover coffee or mixing some limestone into the soil. During my couple very active years observing the broad scale of container gardeners on social media I have noticed that in most things, people are divided into two camps. In this case, I would divide people into long-term and short-term adjusters, the latter being far more likely to replant or change soils for the plant for the sake of pH than the first, which would rather water the plants with acidic or alkaline water to get the soil pH shifted into the right direction.

For the ease of production as well as to avoid complicated and/or long application and verification processes that apply for hazardous pesticides, I decided to side with a neem oil based one. I am aware that the results of my research are overly optimistic about the efficiency of neem oil as an active substance, but some level of efficiency cannot be denied. I found it very appealing that an oil, that is safe to use on human skin and according to some sources doesn't harm bees[20], could be used to fight pests on plants. These were factors that could be used in the marketing of the product and that highlight the ideologies of the company. Pesticides have gotten an increasingly bad reputation in the houseplant community, as the concerns about disappearing pollinators, the climate and even indoor air quality has been increasing. The effects of this were evident in the open comment section of the survey I did for this thesis, which I will discuss in the section *4.2 Reality check and change of plans*.

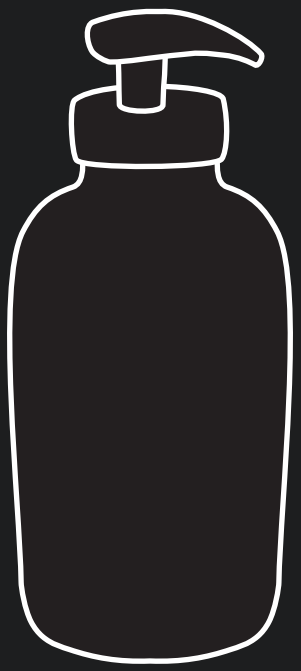
The question of whether to have a pre-made mix of water and neem-oil or supplying pure neem-oil that needs to be diluted was left open at this stage of concepting. Both have their benefits: pre-made mixture is quicker to use, but it requires a preservative, whereas pure neem-oil can be supplied preservative-free, and it has a chance to make the user feel more in control, but also a risk of making the use too much of a hassle. In either case it would be preferable to combine the oil with an emulsifier to help it combine with water and allow a more even spread on vegetation.

Simplicity and natural origin also took the win when it came to the fertilizer. Instead of having a mix of organic fertilizer with a bit of synthetic one for back-up, after discussing it with the company, we agreed upon the organic one for similar reasons as the neem-oil based pesticide. Buzz-words like organic, natural and plant-based were seen as very fruitful and representative of the goals of the care kit.

What I personally found the most essential for the original problems, but least profitable, was to provide a platform of information to the user, which at this point we discussed could realise on their websites in the form of general info about pests and problems, as well as product specific information pages. The links to these pages would be printed as QR-codes on the packaging of the products as well as written out internet addresses.

---

20 *D.P. Abrol, Beekeeping: A Compressive Guide to Bees and Beekeeping (p. 618) (2013)*



FERTILISER

400ml bottle

Amber glass

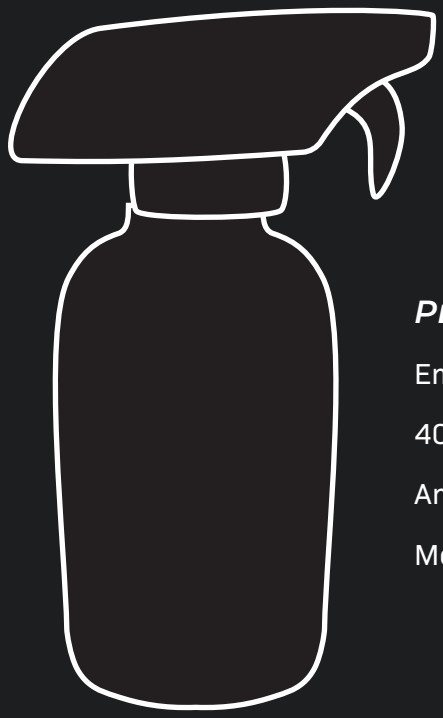
Black pump with a lock-function

PESTICIDE CONCENTRATE

Neeml oil + emulsifier

200ml bottle

Same specs as fertilizer



PESTICIDE SPRAY BOTTLE

Empty spray bottle for diluted pesticide spray

400ml or 200ml bottle

Amber glass with black top

Measure line for neem oil + water

4.2 Reality check and change of plans

At this stage the whole kit started to slowly find its form, yet many things were still open and there were no unequivocal answers. Open topics included quantities of contents, packaging types, producers for both contents and packaging, kit identity and price. In search for answers to these questions I continued contacting suppliers and began gathering a list of sample items and their costs.

With these very rough estimates the production costs of the kit started ranging from around 7€ up to 18€ in some cases. As the production costs can be at maximum around 25% of the resale price for it to be profitable, the price of the kit for the consumer would range between 28€ up to 72 €, which immediately spiked concern. We discussed this with the company and decided our knowledge isn't satisfactory to dictate a price for the kit yet. For this reason, I decided to conduct a brief survey in attempt to seek answers to the open topics I still had.

The survey I created was open for a little over 24 hours and during that time collected over 600 answers. The sole purpose of the survey was to find out the price consumers would be willing to pay for "a plant care kit", contents of which they could decide themselves. The questions and answers were formulated in a way that I hoped to lead to a very clear answer to us, but it unfortunately backfired. All questions were compulsory and technically none had the option of "other/none". This was a conscious choice that was made with the idea that we only cared about the answers of people who were interested, and a non-conscious assumption that people who weren't interested would either drop the quiz or answer the most favourable options, even if they weren't downright interested.

I also got feedback from the unclear construction on some of the questions, which I had mistakenly thought were very clear, such as estimating a price for an imaginary kit with pre-set contents but without stating amounts.

The survey consisted of so many crucial mistakes, that the result were too corrupt for very critical examination. These mistakes are mostly due to a too tightly measured schedule which didn't leave room for any unexpected turn of events, even as minor as needing this survey. The only thing I decided to pick up from the survey, with a level of caution, was that combined 54% of respondents would be willing to pay only under 20€ for the kit. Only 5% were willing to pay over 35€. This is even though 87% of respondents rated themselves as intermediate or experienced in terms of in indoor gardening, who could be expected to pay more, since they are already somewhat invested in the hobby, unlike newbies, who could be expected to avoid big investments right in the beginning. All of this meant that the first concept was way over-priced even if we were able to achieve the cheapest price estimate, which itself was already unlikely considering the low quantity of the first set of kits. The price had to be cut down, which realised as concept 2.0.

4.3 Concept 2.0

After attempts of reducing the price of the proposed kit as it was turned out impossible with the given circumstances, it became apparent that the contents of the kit needed to be cut down. Going back to the initial research and discussing it back and forth with the company, it was concluded that the most sustainable and reasonable choice was to narrow it down to the two most essential products that most plant owners need: a fertiliser and a pesticide.

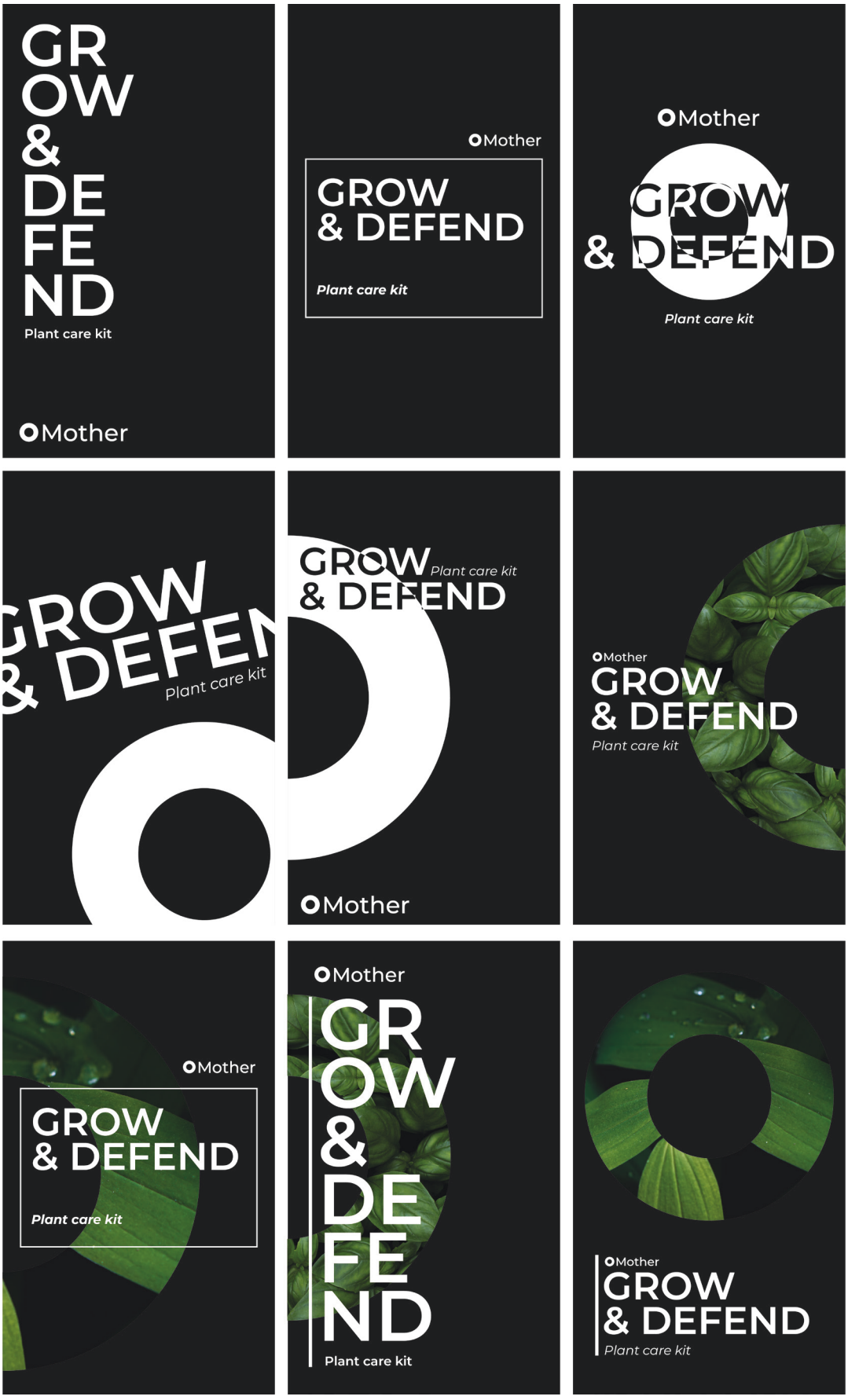
Going down to two products enabled us to combine their packaging sourcing: providing the pesticide as a ready-to-use diluted mixture and the fertilizer undiluted in the same quantity meant that at worst case the tops would need to be sourced separately. This decision also changed the identity of the kit from an all exclusive fix it all, to a convenience kit for novice to intermediate growers. At this point in time I quit stressing about the prices and simply started looking for options for packaging that would fit the brand and convey the proper image of the product.

As with the initial concept, I kept proposing amber glass as a material, since it is rather timeless, gives an impression of quality and preciousness, and as a dark coloured glass the appearance doesn't deteriorate with recycling, which allows for the use of recycled material. At first Dries didn't warm up to the idea, since glass can be tricky with transportation. Surely the bottles still needed to be secured in a box for logistic purposes, so I began searching for an identity for the concept. I sketched and drafted rough options for the cover of the box as well as for the labels, while I was simultaneously looking for the right type of packaging. As their existing product was called the Bloom, I decided to go with matching working names of Grow and Defend for the two products in the kit.

A dark background combined with white text is a common theme for Mother, which I decided to utilize in the packaging design as well. Initially sketching the composition roughly on paper, I very quickly moved to moving things around in Adobe Illustrator and made dozens of iterations of the possible cover for the main packaging. Out of those concepts I routinely picked some out and continued moving things around, replacing objects and iterating further. I experimented a lot with the logo, use of images, as well as the trending theme of using large capital letters and splitting words where they grammatically shouldn't be hyphenated. At this point all the used images were only placeholders. The nine rough concepts that I ended up presenting to the company can be seen on page 29.

The products were targeted to be sold online and also by physical stores. For online sale the amount of information on the packaging isn't as crucial as it is in the store. I anticipated that the final products would likely not go very evidently on the traditional plant care equipment category by design and appearance, which is why I favored the packaging with an image of plants. Out of these nine concepts we discussed the best one to be the one on the middle row in third column. Reasonings included simplicity, amount of information, as well as the experimental use of the logo.

IDEATION FOR BOX FRONT LAYOUT



The composition of the chosen layout concept was still very rough, but it gave some insight of which direction to head with the design of the products themselves. As with the box layout, I first explored the composition a little bit on paper, but very soon turned to Illustrator to play around with objects.

With the labels I payed more attention to the content and the concepts were a little bit further developed than the box layout concepts from which these derived. The key components were the visual of a plant (image or other), the brand, name of the product, type of the product, description and instructions, ingredients list, QR-code and a link to a website, amount of content and additional statements or verifications, such as ”100% vegan”.

During this stage we were discussing about compromising and using plastic bottles that imitate amber glass, so for the sake of testing the concepts on a more comprehensible level I decided to make 3D-models of two types of bottles on Solidworks and rendered quick images on Keyshot, where I fairly carelessly placed the labels with Photoshop, just to get an idea. One of the benefits of doing this was to see how the bottle would translate with the use of a label. On the following pages are the three main types of labels that I experimented with.

Label concept 1

In this concept I tried to utilise plant photography as heavily as possible while avoiding to create inclarity. From the box layouts it became apparent that combining text with images on the background easily makes the layout more noisy. For that reason I used the photography as a background and used a black block to separate the text from the background.

The result ended up reminding of hair care products more than plant care substances. This was the most apparent in the bottle type B. The same association issue became a repeating theme I battled with constantly while designing the labels.

Bottle type A: Label 1

Bottle type B: Label 1

Label 1: Grow

Label 1: Defend

Label concept 2

For the second label concept I went with a more common composition in the plant care product category, with a single, uninterrupted solid image that's on the same hierarchy as an object as the text masses.

In these labels I started experimenting with using more white as well as a more apparent separation between the two products by making one of them white and the other one black. Compared to the label 1, the label 2 layout had a clearer structure which was divided by the photo used in the middle of it. The general appearance is cleaner as the image is only visible from limited directions.

From this label I initially created just one version (Label 2.1) which I presented to the company, and the rest were iterations that followed that, testing out different options in context. The initial problem of an association with cosmetics kept repeating with these ones, which I wasn't able to get rid of with just adjusting individual components. Again the bottle type B amplified this issue.

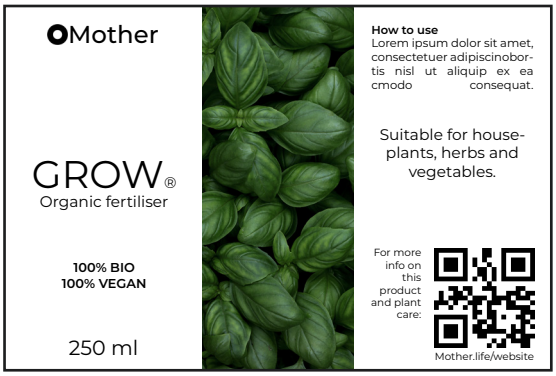
Bottle type A: Label 2.1
White + light photography

Bottle type A: Label 2.3
Black / White + (same) dark photography

Bottle type A: Label 2.2
White + dark photography

Bottle type A: Label 2.4
Black + dark photography

Bottle type B: Label 2.1
White + light photography



Label 2.3: Grow
White + dark photography

Label 2.3: Defend
Black + dark photography

Label concept 3

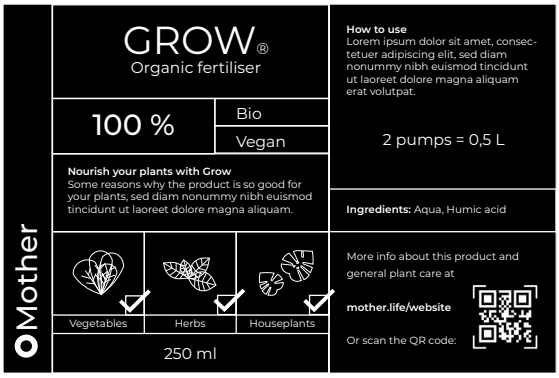
With the third concept I was seeking a more minimalist and colourless look while still trying to mantain the information that the plant photography is able to convey, which is: *"this is a plant related product"*. The inspiration came from old medicine bottles and instead of the photography, I created vector illustrations of plants to illustrate which plants the product is suitable for. My goal was to make them informative and clear, yet playful and artistic.

With this concept the layout came across a little crowded and messy with many unneccesary elements. Instead of giving the layout a structure, the frames around the text masses ended up suffocating it. However, this concept managed to not spike as strong correlation with cosmetics as the previous two had done.

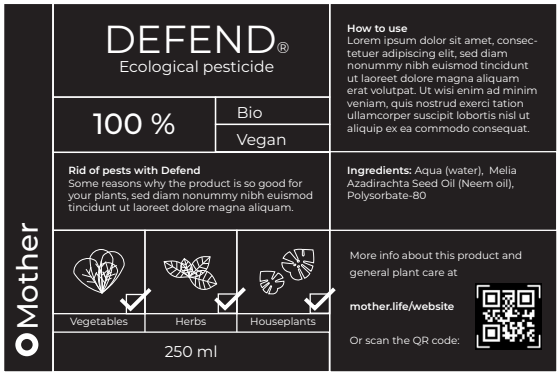
I was intrigued by the transparent label because it would result in a more clear view of the amount of contents, however, it had some crucial downsides.

Aesthetically, not knowing how dark the plastic or amber glass on the bottles was going to be, there was a risk that the different coloured liquids would be disturbingly apparent with that solution. Another thing was, that with the transparent labels they would have to be plastic, whereas with the solid ones they could be made with paper, which fit better to the values of the brand than plastic.

Bottle type B: Label 3.1
Transparent



Label 3.2: Grow
Black



Label 3.2: Defend
Black

Bottle type A: Label 3.1
Transparent

Bottle type A: Label 3.2
Black

Bottle type A: Label 3.3
White

Bottle type A: Label 3.4
Black / White

After the feedback from the company I decided to go forward with the third label concept and develop it further, aspiring to make it less messy. I began by erasing all the unneccesary lines and additional elements that brought no added value, such as the check marks on the plant categories. At this point in time we also had conversations about the packaging again, and decided to finally settle for the amber glass bottles as opposed to plastic ones. The decision was made for the same reasons I had previously mentioned, such as feel of preciousness.

The result after a few iterations, gradually removing elements, were four versions of what I deemend to be the simplest the label could be made with these given elements. The only difference between these labels were the placement of the plant icons and the name of the product. As these were things I couldn't fully grasp in the digital world, I printed these labels out and tested them on bottles I had at home to get an idea of how the layout plays out in the real world.

During this process the placement of the elements realised on a new level, but also the ratio of the label, which became slimmer, revealing more of the bottle under.

Eventually I received samples from the bottles that we had decided to be the final packaging for the products, and after testing the labels on them and doing a few more subtle iterations on the ratios, I decided to go with the one with the icons in the middle of the two text masses, as it created a division between the two sections and allowed for the use of empty space. This also allowed for a more fluent read from left to right, placing the elements according to their hierarchy.

Testing placement order of elements on the labels.

Final placement of elements on the labels.

Simultaneously, while I was working with the labels, I continued to design the box layout, which was far more streamlined as the general concept was already layed out. All that was left was determining and filling in the missing information. In addition to that, I failed to find the perfect stock photo to use on the packaging, which is why I ended taking it into my own hands and photographed a bouquet herbs for the purpose.

The main faces of the box are the cover, which gives out only very basic information, the backside which gives out crucial information on the products, the left side, which has additional information on it, and the top, where the QR code and website address for the kit is placed. As the labels on the products themselves have been stripped to the essentials, the purpose of the box is to perform as a stand alone sales pitch for them. This is especially true for the left side, the content of which was intended to be used as it is also on the website about the products.

Following the example from Mother's website and their use of icons, I created simple, informative illustrations to be paired with the information on the box. As well as I did with the labels, replacing the plant photography with informative illustrations, I decided to do the same for illustrating the contents of the kit. This quite crucial decision was made with the assumption that where ever the products would be sold, there would also be at minimum an open package or at best case, a stand with the products for display. This is important, as the final products are going to be at display at peoples homes. It is an intentional key difference from the majority of competitor products, as the product is intended to fit into the users home and decor, rather than stand out as a household item.

Final layout of box with a new photo.

Testing label on final bottle shape in Photoshop.

While I was finalising the designs, I used 3D models in Autodesk Inventor to figure out the ratios, especially for the box, in addition to building quick paper prototypes of it in real life. I made quick renders of the packages on Keyshot and experimented with fitting the layouts and labels on these 3D images in Photoshop. This method enabled me to iterate quicker while producing less trash, since everything was in digital format.

Testing box layout in 3D format in Photoshop (front).

Testing box layout in 3D format in Photoshop (back).

5. Final results

The final results of this thesis project was initially set as a manufacturing ready kit and refined prototypes of it. As the project went on, that goal became harder to reach within the time frame, and even exceeding it the results did not realise as completely manufacturing ready. This is because of the fact that without knowing the spesific manufacturers of each item, it is practically impossible to produce files and designs that can be simply forwarded to the manufacturer without changes.

The concept remains in a state, where all the digital files are accessible and editable by Mother and if they decide to proceed with it into production they have the means to edit the files freely and according to manufacturers request. Finalising the prototypes was limited to the little time I had over the exceeded schedule, which is why we shifted the goal into producing high quality photography of the kit, intended to use for the sale and marketing of the kit, possibly previous to the assembly of the final products.

The final 2-in-1 product kit concept is minimalistic, modern, true to Mother's brand identity and mission and aspires to empower the user both through function and design. The kit contains 250ml of both a concetrated humic acid fertilizer and the same amount of diluted, neem-oil based ready-to-use all-purpose pesticide-fungicide spray that, unlike most products of the same category, is environmentally friendly and safe on skin contact as well as to use on plants intended for food.

The product is intended to be paired with a site with more information on the products and how to use them in different situations, as well as another site with information on plant care, troubleshooting and prevention, aiming to truly enable the user. The kit is designed to help the user do exactly what the name suggests: grow and defend (their plants). It contains only the essentials, which are ready to use and require no measuring beyond what the packaging enables, which is by amount of pumps or sprays. The product is especially intended for newly interested or intermediately experienced growers both indoors and outdoors in a compact urban environment, but by using high-quality ingredients and materials the concept is scalable to a more professional, perhaps even commercial use. Ideally the current concept would exist with refill options, allowing the user to purchase the heavily packed product only once and refill those indefinitely. These aspects follow the same principles as my reference product from Mother, the Bloom.

In terms of transportation, I created a proposal for a buffering inner structure (p. 49) to pair with the box in the goal of protecting the fragile glass packaging as much as possible. The structure is made to optimise use of material while providing as much cushion against bumps and vibrations as possible, as well as to still provide a relatively pleasant assembly and unboxing experience. This was pursued by constructing the interior from a single piece of cardboard that has been folded from designated spots, requiring no attachments but instead relying on the box itself to keep everything intact. The structure was created through an iterative process as a final last step to secure the bottles in the box.

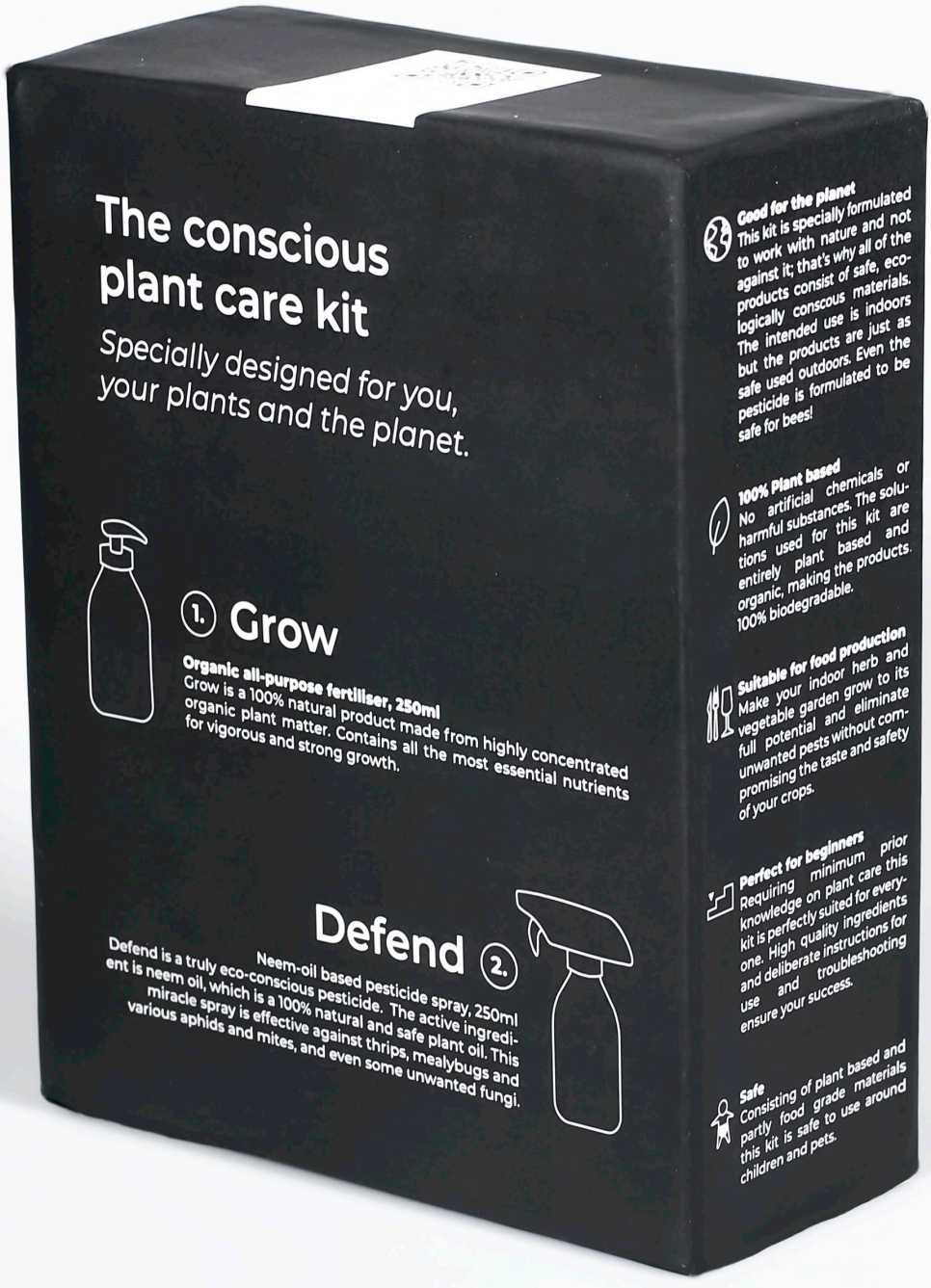


IMAGE 15: Annika Nygrén

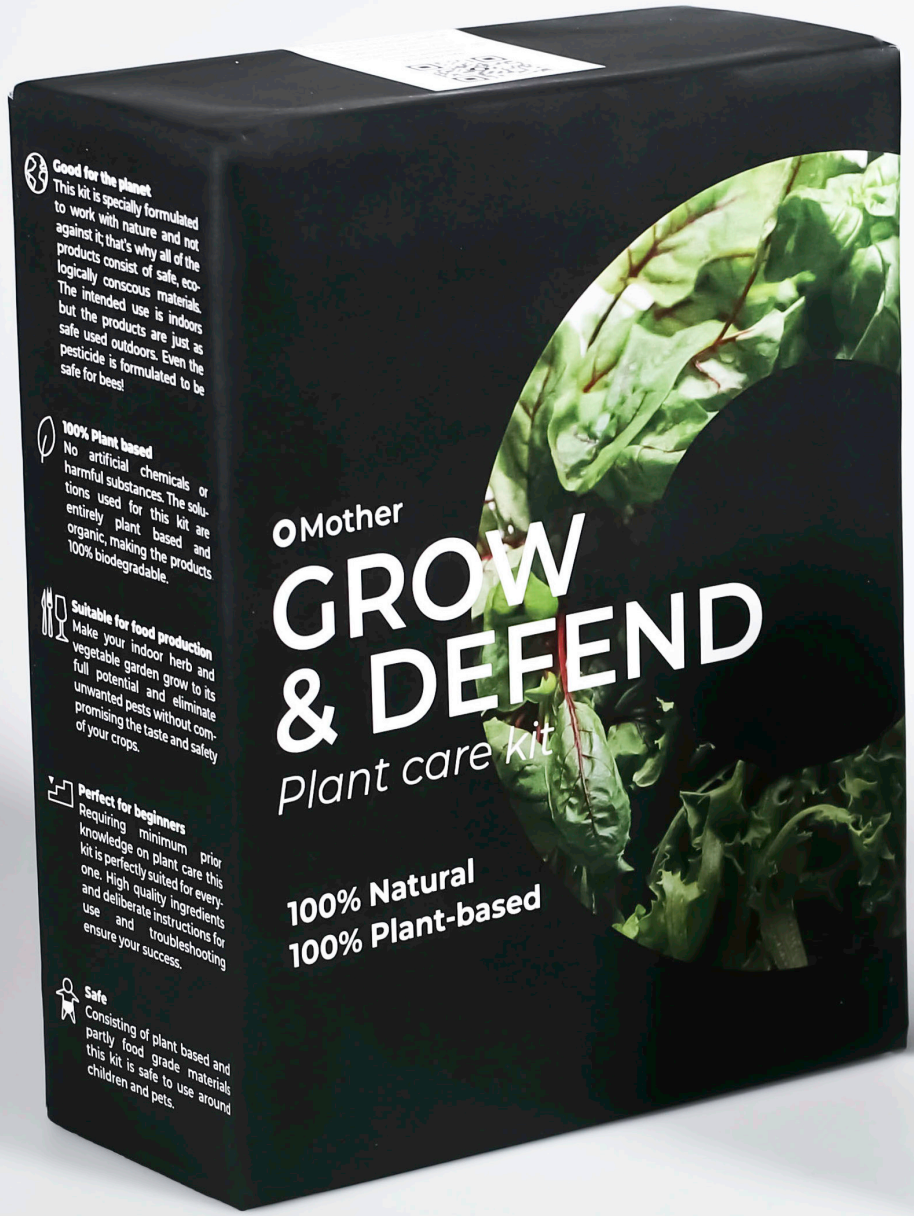
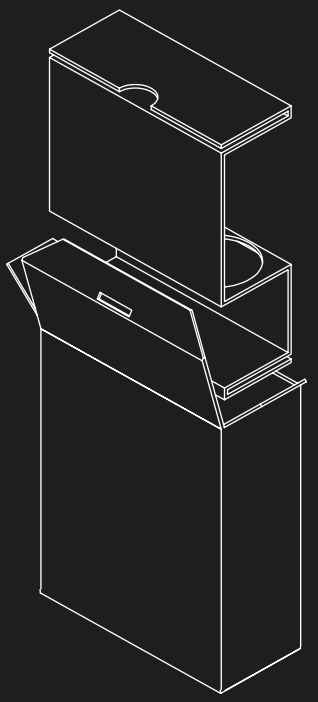
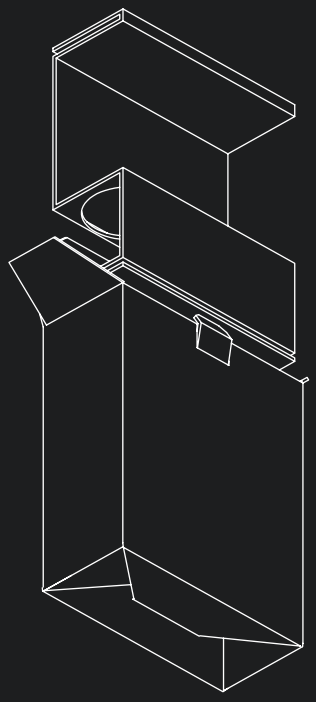
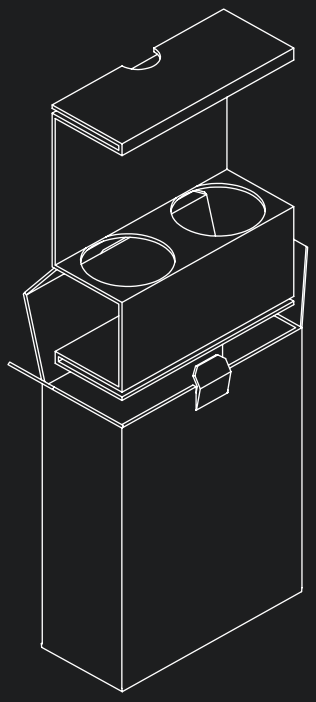
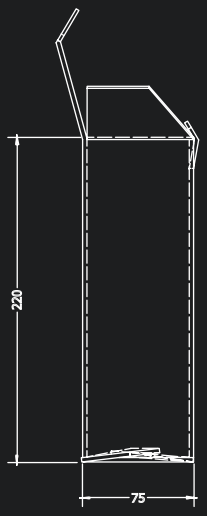

Good for the planet
This kit is specially formulated to work with nature and not against it; that's why all of the products consist of safe, ecologically conscous materials. The intended use is indoors but the products are just as safe used outdoors. Even the pesticide is formulated to be safe for bees!
100% Plant based
No artificial chemicals or harmful substances. The solutions used for this kit are entirely plant based and organic, making the products 100% biodegradable.
Suitable for food production
Make your indoor herb and vegetable garden grow to its full potential and eliminate unwanted pests without compromising the taste and safety of your crops.
Perfect for beginners
Requiring minimum prior knowledge on plant care this kit is perfectly suited for everyone. High quality ingredients and deliberate instructions for use and troubleshooting ensure your success.
Safe
Consisting of plant based and partly food grade materials this kit is safe to use around children and pets.
Mother
GROW & DEFEND
Plant care kit
100% Natural
100% Plant-based

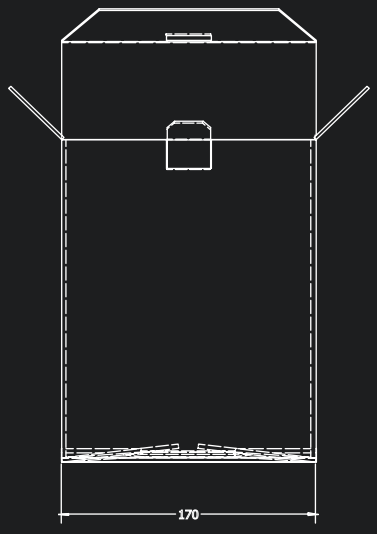
IMAGE 16: Annika Nygrén

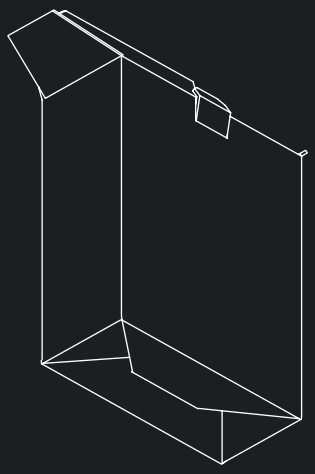


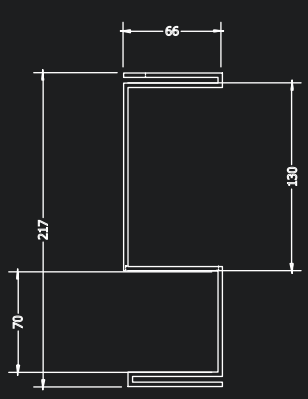


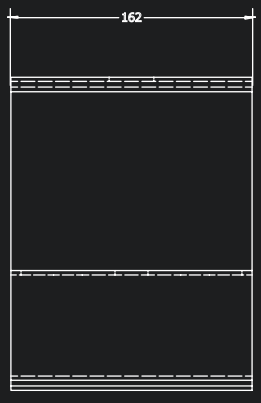


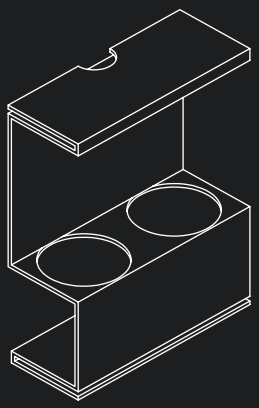

220
75


170




66
130
217
70


162



6. Reflections

The imminent and uppermost thought I have after finishing the project was unsatisfaction of the outcome, since it didn't fill out to the hindsightedly unrealistic expectations I had set for it in the beginning. Having started the project at the beginning of my third bachelor year, which then happened to be the most intense and rewarding period of my life in terms of learning and professional development, I was still lacking the knowledge on preventing the majority of the foolish mistakes I did during the project. Most of the mistakes relate to prioritising of things as well as understanding contraints in time, which together acted as catalyst for failure. I don't, however, think I failed the project, on the contrary I think it was a highly valuable learning experience and helped me grow on a personal and professional level. During the project I learned to utilise tools and methods I was previously foreign or less experienced with and it was the first time I got to dip my toes into a design related topic which was out of my core zone of knowledge. This taught me how I can implement my previous knowledge in related topics into a new area and allowed me to gain confidence in my ability to cope with foreign issues.

If I were to continue the project from where it ended in this thesis, I would dig deeper into the topics of packaging design, materials and colour-texture-finish options, as well as other aspects that play a role in developing a commercial product, and tweak and refine the concepts and designs according to the new insights. For the final result to be a manufacturing ready kit, also the formulas of the products themselves would need to be tested and adjusted for optimal performance and usability simultaneously with their packaging. Ideally the final product would be a conscious entirety that is designed and developed for sustainability in terms of time and the environment. Achieving this would require more knowledge of the environmental impacts of different options and methods.

As the intention was, I would also at minimum build a connected site for troubleshooting and prevention of plant growing issues, as I had previously stated that knowledge is the best prevention and treatment for any issue. If the concept ever turns into a product, I would wish it to scale up to a series of plant care products or more exclusive kits and more lightly packaged refill options for the sturdier one-time-purcase prodcts, such as the outcome of this thesis.

SOURCES

IMAGES

Image 1: Annika Nygrén, photography for this project, 2018.

Image 2: Mother (2018), Bloom -grow light. Accessed 2.10.2018. Available at: instagram.com/mother.life.official

Image 3: Mother (2018), Bloom -grow light. Accessed 2.10.2018. Available at: instagram.com/mother.life.official

Image 4: Mother (2018), Bloom -grow light. Accessed 2.10.2018. Available at: instagram.com/mother.life.official

Image 5: Mother (2018), Radish soup, advisorial image for Bloom grow light. Accessed 2.10.2018. Available at: instagram.com/mother.life.official

Image 6: Mother (2018), Logo use with brand name.

Image 7: Plant Theatre Ltd, Funky Veg kit £14.99. Accessed 2.10.2018. Available at: https://www.plant-theatre.co.uk/funky-veg-kit.html

Image 8: Pinch Provisions, Plant Lady Kit $24.00 USD. Accessed 2.10.2018. Available at: https://www.pinchprovisions.com/products/plant-lady-kit

Image 9: Bonsai Direct, Comprehensive Bonsai Tree Care Kit £19.00. Accessed 2.10.2018. Available at: https://www.bonsaidirect.co.uk/bonsai-care-kit-7832.html

Image 10: GrowScripts, Plant Care kits: 6-in-1 Complete Plant Care Kit, 2-in-1 Essential Plant Food Kit. Accessed 2.10.2018. Available at: https://www.growscripts.com/plant-care-kits/

Image 11: The Present Tree, Organic Plant Care Kit £18.00. Accessed 2.10.2018. Available at: https://thepresenttree.com/products/organic-plant-care

Image 12: Luster Leaf, Rapitest Soil Test Kit. Accessed 2.10.2018. Available at: http://www.lusterleaf.com/img/catalog_2019/luster%20leaf%202019%20catalog%202.pdf

Image 13: Luster Leaf, Environmental Concepts 1662, Soil Test Kit. Accessed 2.10.2018. Available at: http://www.lusterleaf.com/nav/soil_test.html

Image 14: General Hydroponics, pH Control Kit. Accessed 2.10.2018. Available at: https://generalhydroponics.com/ph-buffers

Images 15-16: Annika Nygrén, photography for this project, 2019.

LITERATURE, ARTICLES AND PUBLICATIONS

1: Instead of houses, young people have houseplants, The Economist 6.8.2018. Accessed 2.10.2018. Available at: https://www.economist.com/graphic-detail/2018/08/06/instead-of-houses-young-people-have-houseplants

2: Bodie V. Pennisi, Growing Indoor Plants with Success, Georgia, USA: Georgia Cooperative Extension, 2017. 27 p. Accessed 2.10.2018. Available at: http://extension.uga.edu/publications/detail.html?number=B1318&title=Growing%20Indoor%20Plants%20with%20Success

3: Kathleen M. Kelley, Mary Concklin, Caring for Houseplants, Pennsylvania, USA: The Pennsylvania State University, College of Agricultural Sciences, PennState Extension, 2007. Accessed 2.10.2018. Available at: https://extension.psu.edu/caring-for-houseplants

4: Mary Concklin, Kathleen M. Kelley, Preventing, Diagnosing, and Correcting Common Houseplant Problems, The Pennsylvania State University, College of Agricultural Sciences, PennState Extension, 2016. Accessed 2.10.2018. Available at: https://extension.psu.edu/preventing-diagnosing-and-correcting-common-houseplant-problems

5: Missouri Botanical Garden, Common Garden Pests and Problems. Accessed 2.10.2018. Available at: http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/help-for-the-home-gardener/advice-tips-resources/pests-and-problems.aspx

6: Janet Knodel, Esther McGinnis, Kasia Kinzer, Ron Smith, Houseplants Proper Care and Management of Pest Problems, NDSU Extension (2016). Acessed 2.10.2018. Available at: https://www.ag.ndsu.edu/publications/home-farm/houseplants-proper-care-and-management-of-pest-problems

7: National Pesticide Information Center, Fungicides (2017). Accessed 2.10.2018. Available at: http://npic.orst.edu/

8: Janna Beckerman, Disease Management Strategies for Horticultural Crops, Purdue Extension. Accessed 2.10.2018. Available at: https://www.extension.purdue.edu/extmedia/bp/bp-69-w.pdf

9: W.S. Cranshaw, B. Baxendale, Insect Control: Horticultural Oils, Colorado State University Extension, 12/2013. Accessed 2.10.2018. Available at: http://extension.colostate.edu/topic-areas/insects/insect-control-horticultural-oils-5-569/

10: David L. Clement (1993), modified by Diane M. Karasevicz (1/1995), An Introduction to Plant Diseases, Cornell Cooperative Extension. Accessed 2.10.2018. Available at: https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/f/575/files/2015/12/04diseases-x8lw9d.pdf

11: The Australian Wine Research Institute, Vineyard activity guide, Measuring Soil pH, 2010. Accessed 2.10.2018. Available at: https://www.awri.com.au/wp-content/uploads/v_activity_soil_ph.pdf

12: Johannes Rousk, Erland Bååth, Philip C Brookes, Christian L Lauber, Catherine Lozupone, J Gregory Caporaso, Rob Knight and Noah Fierer, Soil bacterial and fungal communities across a pH gradient in an arable soil, The ISME Journal volume 4, pages 1340–1351 (2010). Accessed 2.10.2018. Available at: https://www.nature.com/articles/ismej201058

13: Paul R. Fisher, William R. Argo, Managing the pH of container media, University of Hampshire Cooperative Extension, 2015. Accessed 2.10.2018. Available at: http://www.greenhouse.cornell.edu/crops/factsheets/pHarticl.pdf

14: Sherry Combs, Reducing Soil pH, Wisconsin Horticulture, 2007. Accessed 2.10.2018. Available at: https://hort.uwex.edu/articles/reducing-soil-ph/

15: Isman Murray, Botanical insecticides, deterrents, and repellents in modern agriculture and an increasingly regulated world., National Center for Biotechnology Information, PubMed, 2006. Accessed 2.10.2018. Available at: https://www.ncbi.nlm.nih.gov/pubmed/16332203

16: Mishra AK, Singh N, Sharma VP, Use of neem oil as a mosquito repellent in tribal villages of mandla district, madhya pradesh, National Center for Biotechnology Information, PubMed, 1996. Accessed 2.10.2018. Available at: [35] https://www.ncbi.nlm.nih.gov/pubmed/8936291

17: Estefânia V. R. Campos, Jhones L. de Oliveira, Mônica Pascoli, Renata de Lima and Leonardo F. Fraceto, Neem Oil and Crop Protection: From Now to the Future, National Center for Biotechnology Information, PubMed, 2016. Accessed 2.10.2018. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5061770/

18: Wenneker M., Kanne J., Use of potassium bicarbonate (Armicarb) on the control of powdery mildew (Sphaerotheca mors-uvae) of gooseberry (Ribes uva-crispa), National Center for Biotechnology Information, PubMed, 2010. Accessed 2.10.2018. Available at: https://www.ncbi.nlm.nih.gov/pubmed/21534463

19: EU Pesticides Database. Accessed 2.10.2018. Available at: https://ec.europa.eu/commission/index_en

20: D.P. Abrol, Beekeeping: A Compressive Guide to Bees and Beekeeping, p. 618 (2013).

Other sources

Contacts from Mother:

Dries Bovijn
Ann-Sofie Vandamme
Stien Bovijn

Placeholder images on concepts from Unsplash from following artists:

Sarah Sosiak @sarahsosiak
Rober Nelson @iambobnelson
Ian Espinosa @greystorm
Chris Lee @chrisleeiam
Scott Webb @scottwebb
Chuttersnap @chuttersnap
Rob Pumphrey @robpumphrey

Thank you

I wish to thank my official thesis supervisor professor Simo Puintila for the guidance and help, as well as my friend and mentor Laura Kytömäki for the immense amount of support through the project. Also a special thank you to the amazing people at Mother who enabled this project, especially Dries Bovijn and Ann-Sofie Vandamme.